

A NEW SPECIES OF THE GENUS *HASLUNDICHILIS* (MICROCORYPHIA, MACHILIDAE) FROM CHINA AND REDESCRIPTION OF *HASLUNDICHILIS HEDINI* (SILVESTRI)

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Abstract One new species of genus *Haslundichilis* (Microcoryphia, Machilidae), *H. qixiaensis* sp. nov. is described and *Haslundichilis hedini* (Silvestri) is redescribed from China. *H. qixiaensis* sp. nov. is easily distinguished from *H. hedini* by body length, the number of spines on IXth coxites and the character of parameres. A key to known species of *Haslundichilis* of China is given. Type specimens are deposited in the collections of College of Life Sciences of Nanjing Normal University, China.

Key words Archaeognatha, Microcoryphia, Machilidae, *Haslundichilis*, new species, China.

Approximately 500 species of bristletails were described in the world (Mendes, 1990a; Sturm and Machida, 2001). To date, there are 28 species found in China (Silvestri, 1906, 1934, 1936, 1943; Uchida, 1965; Xue and Yin, 1991; Mendes, 1990b; Mendes *et al.*, 2000; Zhang *et al.*, 2005; Huang *et al.*, 2006; Zhang and Li, 2009; Yu *et al.*, 2010; Cheng *et al.*, 2011; Song *et al.*, 2011; Zhang and Zhou, 2011). The genus *Haslundichilis* Wygodzinsky is a small group of family Machilidae. So far, 1 species of *Haslundichilis* was described from China (as *Forbicina hedini* Silvestri, 1934), 1 species from USSR (Mendes, 1982), 2 species from Afghanistan (Wygodzinsky, 1950, 1962), 1 species from India (Wygodzinsky, 1952), and 1 species from Korea (Lee and Choe, 1992). The characters of *Haslundichilis* are as follows: maxillary and labial palps of male with transformed chaetotaxy, coxal stylets on mid and hind legs, spiniform setae of legs abundant, a pair of eversible vesicles on abdominal segments I–VII, urosternites rectangle to acutangle, parameres present on the VIIIth and IXth abdominal segments, male genitalia completely covered by IXth coxites, ovipositor of the primary type. The genus *Haslundichilis* can be distinguished from *Haslundiella* by the chaetotaxy of maxillary and labial palps of male, and parameres on the VIIth abdominal segment or VIIIth and IXth abdominal segments (Mendes, 1990a). *H. quadric* Wygodzinsky, 1952 and *H. lindbergi* Wygodzinsky, 1962 are devoided of parameres on the VIIIth abdominal segment, which are probably not belong to *Haslundichilis*. While examining the specimens of

Haslundichilis collected from China, we found a new species, *Haslundichilis qixiaensis* sp. nov. and the known species, *Haslundichilis hedini* (Silvestri). We describe and illustrate the two species and provide a key to the known species of the genus *Haslundichilis* of China.

The specimens are deposited in the collections of College of Life Sciences of Nanjing Normal University, China. The morphological terminology follows that of Mendes (1990b). The measurements in the paper are in millimeters (mm).

Family Machilidae Grassi, 1888

Haslundichilis Wygodzinsky, 1950

Haslundichilis qixiaensis sp. nov. (Figs 1–11)

Holotype NNUSB0275, a male adult; China, Mt. Qixia, Nanjing City, Jiangsu Province, on fallen broad leaves (32°09'N, 118°57'E; alt. 112 m), 22 May 2004, coll. ZHANG Jia-Yong. Paratypes NNUSB0276–0278, 3 male adult, same data as holotype.

Body length 7.8–8.5 mm; antennae 9.5 mm; terminal filament 9.0–9.5 mm; cerci 3.1–4.5 mm. Body brownish-grey, covered densely with scales and with pigments not especially dark.

Head (Fig. 1) yellowish. Clypeus and labrum covered with numerous short, thin setae. Frons almost flat, scaled between antennae and ocelli, without setae on frons. The midline of frons yellow.

Compound eyes obviously transversally enlarged, reddish-brown (in alcohol), contact line/length (cl/l): 0.47–0.50; length/width (l/w): 0.68–0.70. Ocelli (Fig. 2) reddish-brown, club-shaped, sublateral, the distance between ocelli obviously

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longer than the length of ocellus, the width of ocellus highly narrower than that of compound eye (width of ocellus about 0.34 – 0.36 of that of compound eye).

Antennae longer than body length, antennae length/body length about 1.1 – 1.3. Scapus, pedicellus and flagellum of antennae densely scaled. Scapus rather long (length/width about 2); pedicellus as long as wide. Color of segments of flagellum light-brownish and pale, junctions between segments pale. Divisions number of flagellum maximum observed 24 – 26, proximal 10 divisions not annulated, divisions 11 – 16 annulated into 3 – 4 annuli, divisions 17 – 24 with 6 – 10 annuli. The last chains with 9 – 10 annuli, which are about as long as wide. The distal chains with sensillum and sensorial points.

Labial palp as in Fig. 3, article I not scaled, articles II – III sparsely scaled and dense setae; article III obviously swollen, almost obtuse-angle like, with sensorial cones on apical part.

Mandibles quite robust, provided with four typical apical teeth. Maxillary palp (Fig. 4) provided with numerous short setae. Setae in articles V – VII denser than those in articles I – IV. Articles III – VII scaled densely. External apophysis of article I cone-shaped, slightly curved backwards and setae sparsely on ventral surface. Article II with setae curved inwards, not extending beyond the third article; article II with dense short setae on ventral surface and few setae on dorsal surface. Article III with dense short setae on ventral surface and few setae on internal distal end; article VII cone-shaped. Articles III – IV with long setae densely on ventral surface, which as long as width of corresponding articles. Dorsal surface of the articles V – VII with hyaline spines as follows, V: 1 – 3; VI: 8 – 12; VII: 10 – 12. Ratio of length article VII/VI: 0.98 – 1.00; article IV/V: 0.62 – 0.65.

Legs (Figs 5 – 7) and coxal stylets scaled. Mid and hind legs with coxal stylets. Coxal stylet with ratio in length to coxa about 0.5. Femur of fore leg not swollen, ratio of length to width: 1.50 – 1.55. Long spines present on trochanter and femur, light-colored, which as long as width of trochanter and femur. Tarsal scopula absent. Length of tibia I: 0.65 – 0.70; tibia II: 0.6 – 0.7; tibia III: 0.66 – 0.70. Fore leg stronger than others, tibia of hind leg not obviously elongated.

Urosternites not pigmented. Abdominal stylet of segments not especially elongated except IXth segment. Abdominal segments I – VII each with a pair of eversible vesicles. Sternum V with nearly right posterior angle (89° – 90°); length/basal width of urosternite V (Fig. 8): 0.58 – 0.60. Stylet about 0.5 as long as coxite V. Urosternite VII not swollen on its inner posterior part (Fig. 9).

Parameres present on the VIIIth and IXth

abdominal segments, clearly articulated; penis only present on the IXth abdominal segment (Figs 10 – 11). A pair of parameres with 1 + 5 divisions (or 6 divisions) on the VIIIth abdominal segment was not covered by VIIIth urosternite (Fig. 10). A penis and a pair of parameres with 1 + 5 divisions (or 6 divisions) on the IXth abdominal segment extending backward to 2/3 of length of the urosternite IX (Fig. 11). Penis normal, shorter than length of paramere, ratio bp/tp: 1.3, opening of penis small and apical. Male genitalia completely covered by the IXth urosternite. Apical spine of abdominal stylets strong. IXth coxites provided with 0 – 1 spines near apex. Length ratios of stylet (excluding apical spine) to coxite, V: 0.45 – 0.50; VIII: 0.56 – 0.62; IX: 0.9 – 1.0; length ratios of apical spine to stylet, V: 0.25 – 0.30; VIII: 0.30 – 0.33; IX: 0.17 – 0.20. Terminal filament and cerci without piliform scales, with numerous scales, a few cilia and some strong spines.

Diagnosis. The new species is similar to *H. hedini* (Silvestri) and *H. viridis* Lee and Choe, but can be distinguished by the following characters: body length about 7.0 – 8.5 mm in *H. qixiaensis* sp. nov. (9.2 mm in *H. hedini*; 11 – 12 mm in *H. viridis*); parameres on VIIIth and IXth abdominal segments with 1 + 5 divisions in *H. qixiaensis* sp. nov. (parameres on VIIIth abdominal segment with 1 + 6 divisions and parameres on IXth abdominal segment with 1 + 7 divisions in *H. hedini*; parameres on VIIIth abdominal segment with 1 + 6 divisions and parameres on IXth abdominal segment with 1 + 5 divisions in *H. viridis*). The new species can be distinguished from *H. quadri* Wygodzinsky, 1952 and *H. lindbergi* Wygodzinsky, 1962 by the characters of paramera (Wygodzinsky, 1952, 1962). Parameres present on VIIIth and IXth abdominal segments in *H. qixiaensis* sp. nov. (parameres present on IXth abdominal segments in *H. quadric* and *H. lindbergi*).

Etymology. The specific name refers to the type locality.

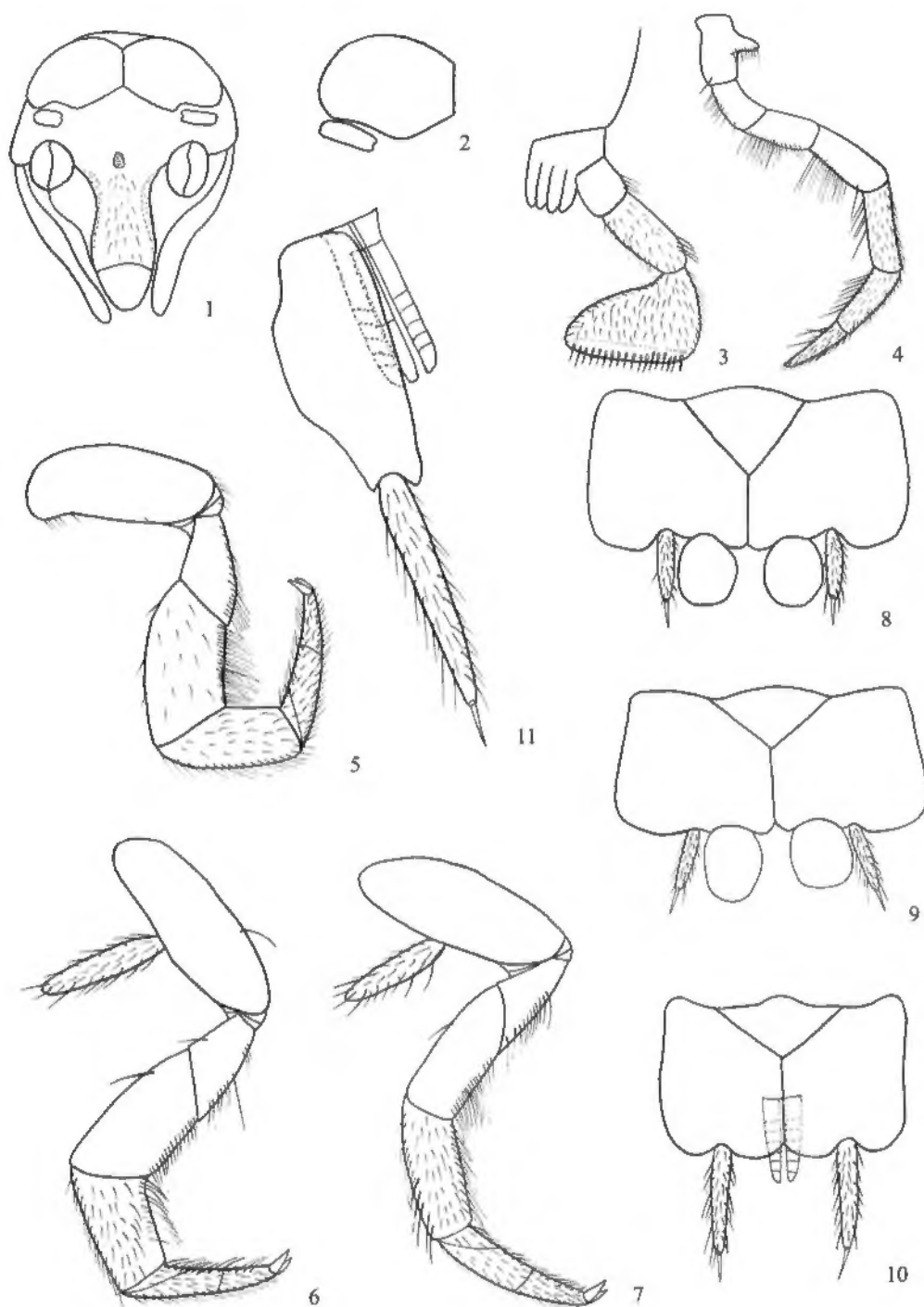
Distribution. China (Jiangsu Province).

Hashundichilis Wygodzinsky, 1950

Hashundichilis hedini (Silvestri, 1934) (Figs 12 – 21)

Material examined. NNUSB0279, a male adult; China, Mt. Maji, Tianshui City, Gansu Province, on the uppermost layer of the forest floor consisting chiefly of fallen leaves and other decaying organic matter (34° 3' N, 106° 0' E), at an elevation of 1550 m, 26 July 2006, coll. ZHANG Jia-Yong.

Body length 9.2 mm; antennae 4.5 mm (broken); terminal filament 8.3 mm; cerci 4.0 mm. Body brownish-grey, covered densely with scales and with pigments not especially dark. Epidermic pigment on a head capsule, maxillae, labial palp, legs.



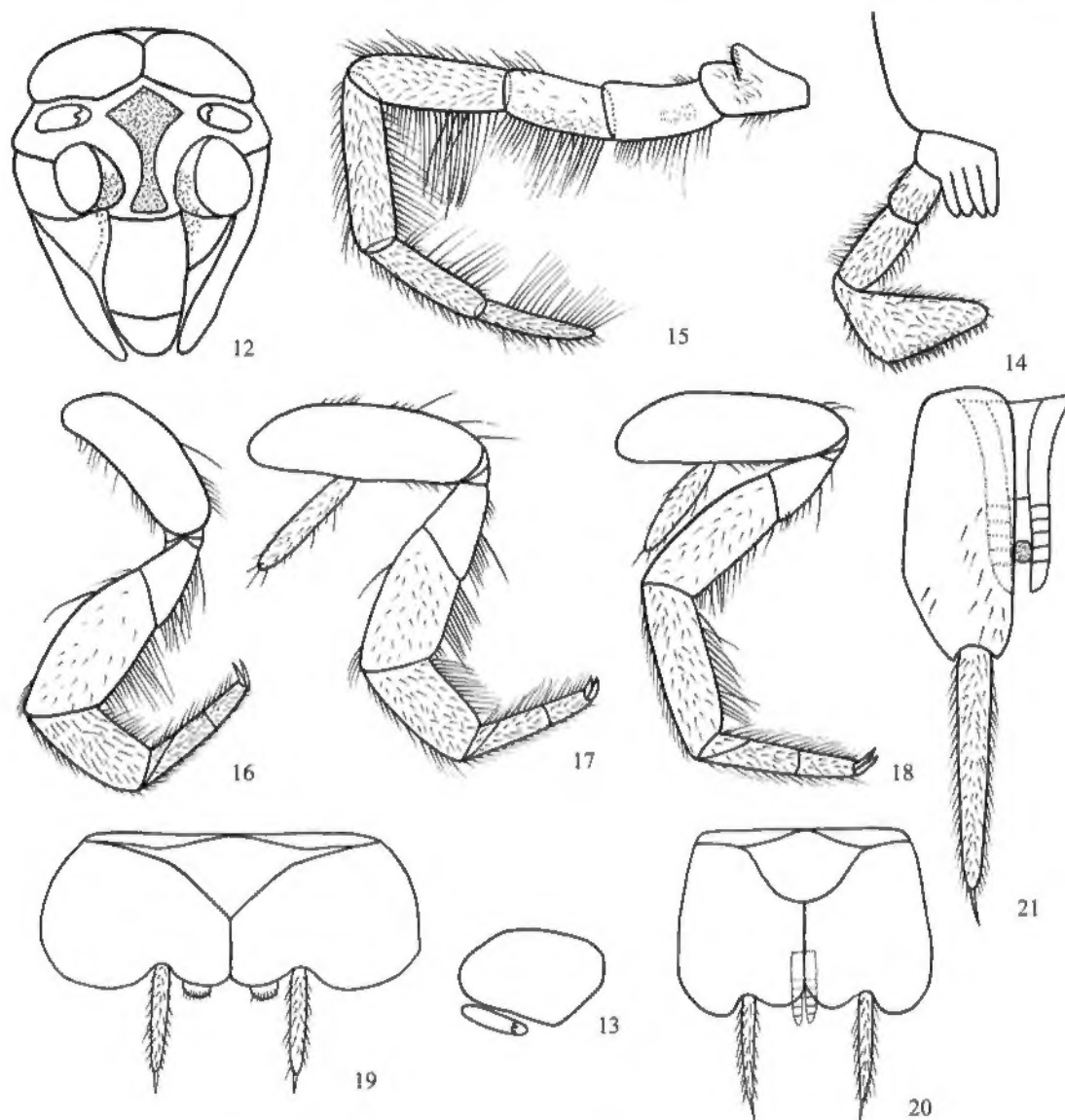
Figs 1–11. *Hashundichilis qixiaensis* sp. nov., male. 1. Head, frontal view. 2. Oculus and ocellus. 3. Labial palp. 4. Maxillary palp. 5. Fore leg. 6. Mid leg. 7. Hind leg. 8. Urosternite V. 9. Urosternite VII. 10. Coxite of the IX abdominal segment with genital appendages. 11. Coxite of the IX abdominal segment with genital appendages.

Head (Fig. 12) brown between antennae, frons, clypeus and labrum. Clypeus and labrum covered with numerous long, thin setae. Frons flat, scaled between antennae and ocelli, without setae on frons.

Compound eyes obviously transversally enlarged, brownish-black (in alcohol), contact line/length (cl/l): 0.43; length/width (l/w): 0.65 (Fig. 13). Ocelli reddish-brown, oval-shaped, sublateral, the

distance between ocelli obviously longer than the length of ocellus, the width of ocellus highly narrower than that of compound eye (width of ocellus about 0.5 of that of compound eye).

Scapus, pedicellus and flagellum of antennae densely scaled. Scapus rather long (length/width about 2); pedicellus as long as wide. Color of segments of flagellum light-brownish and pale,



Figs 12 – 21. *Hashundichilis hedini* (Silvestri), male. 12. Head, frontal view. 13. Oculus and ocellus. 14. Labial palp. 15. Maxillary palp. 16. Fore leg. 17. Mid leg. 18. Hind leg. 19. Urosternite V. 20. Coxite of the IX abdominal segment with genital appendages. 21. Coxite of the IX abdominal segment with genital appendages.

junctions between segments pale.

Labial palp as in Fig. 14, article I not scaled, articles II – III sparsely scaled and dense setae; article III brownish, obviously swollen, almost obtuse-angle like, with sensorial cones on apical part.

Mandibles quite robust, provided with four typical apical teeth. Maxillary palp (Fig. 15) provided with numerous short setae. Article I – VII scaled densely. Articles II – VII with long setae on ventral surface, which longer than width of corresponding articles. External apophysis of article I cone-shaped, slightly curved backwards and setae sparsely on ventral surface. Article II with setae curved inwards, not extending beyond the third article; article II with dense long setae on ventral surface. Article III with dense long setae on ventral surface and few setae on internal distal end; article VII cone-shaped. Dorsal

surface of the articles V – VII with hyaline spines as follows: V: 1 – 2; VI: 10 – 14; VII: 12 – 16. Ratio of length article VII/VI: 1.00; article IV/V: 1.04.

Legs (Figs 16 – 18) and coxal stylets scaled. Mid and hind legs with coxal stylets. Coxal stylet with ratio in length to coxa about 0.6. Femur of fore leg not swollen, ratio of length to width: 1.6. Long spines present on legs, light-colored. Tarsal scopula absent. Length of tibia I: 0.7; tibia II: 0.62; tibia III: 0.8. Fore leg stronger than others, tibia of hind leg not obviously elongated.

Urosternites not pigmented. Abdominal stylet of segments not especially elongated except IXth segment. Abdominal segments I – VII each with a pair of eversible vesicles. Sternum V with acute-angle (85°); length/basal width of urosternite V (Fig. 19): 0.42. Urosternite VII not swollen on its inner posterior part.

Paramera present on the VIIIth and IXth abdominal segments, clearly articulated; penis only present on the IXth abdominal segment. A pair of parameres with 1 + 6 divisions (or 7 divisions) on the VIIIth abdominal segment was not covered by VIIIth urosternite (Fig. 20). A penis and a pair of parameres with 1 + 7 divisions (or 8 divisions) on the IXth abdominal segment extending backward to 2/3 of length of the urosternite IX (Fig. 21). Penis normal, shorter than length of paramere, ratio bp/tp: 1.5, opening of penis small and apical. Male genitalia completely covered by the IXth urosternite. Apical spine of abdominal stylets strong. IXth coxites provided with 11–12 spines near apex. Length ratios of stylet (excluding apical spine) to coxite, V: 0.50; VIII: 0.55; IX: 0.80; length ratios of apical spine to stylet, V: 0.33; VIII: 0.33; IX: 0.20.

Terminal filament and cerci without piliform scales, with numerous scales, a few cilia and some strong spines.

Diagnosis. The characters of this species are consist with the original description of *H. hedini* (Silvestri, 1934). *H. hedini* is easily distinguish from *H. qixiaensis* sp. nov. by body length, the number of spines on IXth coxites and the character of parameres.

Distribution. China (Gansu Province).

Key to species of the genus *Hashudichilis* of China.

1. A pair of parameres with 1 + 6 divisions on the VIIIth abdominal segment, a pair of parameres with 1 + 7 divisions on the IXth abdominal segment, IXth coxites provided with 11–12 spines near apex *H. hedini* (Silvestri)
Parameres with 1 + 5 divisions on the VIIIth and IXth abdominal segment, IXth coxites provided with 0–1 spines near apex *H. qixiaensis* sp. nov.

REFERENCES

- Cheng, H-Y, Yu, D-N and Zhang, J-Y 2011. A new species of the genus *Pedetontinus* (Microcoryphia, Machilidae) from China. *Acta Zootax. Sinica*, 36: 36–39. [动物分类学报]
- Huang, F-S, Song, Z-S and Liang, A-P 2006. A new bristletail species of the genus *Allopsonus* Silvestri (Microcoryphia: Machilidae) from Shaanxi, China. *Orient. Insecta*, 40: 267–272.
- Lee, B. H. and Choe, G. H. 1992. Two new species of Microcoryphia (Insecta) from Korean. *Korean J. Syst. Zool.*, 8: 19–33.
- Mendes, L. F. 1982. Contribution à la connaissance des thysanoures (Microcoryphia et Zygentoma: Apterygota) de l'URSS asiatique. *Bolm. Soc. Port. Ciênc. Nat.*, 21: 59–74.
- Mendes, L. F. 1990a. On a new species of *Pedetontinus* Silvestri, 1943 (Microcoryphia, Machilidae) from Northern Korea. *García de Orta ser. Zoologia*, 17: 53–58.
- Mendes, L. F. 1990b. An annotated list of generic and species names of Machilidae (Microcoryphia, Insecta) with identification keys for the genera and geographical notes. *Estud. Ens. Docum.*, 155: 1–127.
- Mendes, L. F., Gaju-Ricart, M., Bach de Roca, C. and Molero-Baltanás, R. 2000. On some Silvestri species of Machilidae (Microcoryphia, Insecta) which types are in the Museum National d'Histoire Naturelle, Paris. *Pedobiologia*, 44: 268–284.
- Silvestri, F. 1906. Note sui Machilidae. III. Descrizioni di un nuovo genere e di sei nuove specie. *Redia Firenze*, 3: 325–335.
- Silvestri, F. 1934. Schwedisch-chinesische wissenschaftliche expedition nach den nordwestlichen Provinzen Chinas. *Arkiv. För Zoologi*, 27: 1–7.
- Silvestri, F. 1936. Descrizione di alcuni Machilidae (Thysanura) della Cina. *Notes Entom. Chi. Mus. Heude, Shanghai*, 3: 103–115.
- Silvestri, F. 1943. Contributo alla conoscenza dei Machilidae (Insecta, Thysanura) del Giappone. *Boll. Lab. Zool. Gen. Agr. Portici*, 32: 283–306.
- Song, Z-S, Huang, F-S and Liang, A-P 2011. *Machilontus* (s. str.) medogensis Song et Huang, sp. nov. from Tibet, the northernmost record of the genus *Machilontus* Silvestri, 1912 and the first record of the family Meinertellidae (Insecta: Microcoryphia: Machiloidea) in China. *Zootaxa*, 2822: 61–68.
- Sturm, H. and Machida, R. 2001. Handbook of Zoology; Band 4. Arthropoda; Insecta; Teilband/ Part 37. Walter de Gruyter GmbH & Co. KG, Berlin, Germany. 37: 1–213.
- Uchida, H. 1965. *Pedetontus* from Formosa (Thysanura: Machilidae). *Spec. Bull. Lep. Soc. Jap.*, 1: 249–252.
- Wygodzinsky, P. 1950. The 3rd Danish Expedition to Central Asia. Zoological Results 2. Thysanura (Insecta) aus Afghanistan. *Vidensk. Medd. Dan. Naturhist. Foren.*, 112: 139–155.
- Wygodzinsky, P. 1952. On some Machilidae from the Himalayas (Insecta, Thysanura). *Ann. Mag. Nat. Hist.*, 12: 42–46.
- Wygodzinsky, P. 1962. Neue Beiträge zur Kenntnis der Thysanuren und Machilida Afghanistans. *Opusc. Entom. Lund.*, 27: 219–228.
- Xue, L-Z and Yin, W-Y 1991. Two new species of Machilidae from the Tianmu Mountain, China (Microcoryphia). *Contr. Shanghai Inst. Entomol.*, 10: 77–86.
- Yu, D-N, Zhang, W-W and Zhang, J-Y 2010. Two new species of the genus *Pedetontus* (Microcoryphia, Machilidae) from China. *Acta Zootax. Sinica*, 35: 444–450. [动物分类学报]
- Zhang, J-Y, Song, D-X and Zhou, K-Y 2005. A new species of the genus *Pedetontinus* (Microcoryphia, Machilidae) from China. *Acta Zootax. Sinica*, 30: 549–554. [动物分类学报]
- Zhang, J-Y and Li, T 2009. A new bristletail species of the genus *Pedetontinus* (Microcoryphia, Machilidae) from China. *Acta Zootax. Sinica*, 34: 203–206. [动物分类学报]
- Zhang, J-Y and Zhou, K-Y 2011. Descriptions of one new genus and six new species of Machilidae (Insecta: Archacognatha) from China; morphological and molecular data. *J. Nat. Hist.*, 45: 1131–1164.

中国哈蚧属（石蛎目，石蛎科）一新种及赫氏哈蚧重新描述

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摘 要 记述采自江苏南京栖霞山哈蚧属 1 新种栖霞哈蚧，即 *Haslundichilis qixiaensis* sp. nov., 并重新描述了采自甘肃天水麦积山的赫氏哈蚧。

栖霞山哈蚧，新种 *Haslundichilis qixiaensis* sp. nov. (图 1~11)

体长 7.0~8.5 mm；复眼长/宽为 0.68~0.70，中连线/长为 0.47~0.50，复眼横向加宽，红棕色；第Ⅷ、Ⅸ腹节上具阳基侧突，仅第Ⅸ腹节上具阳茎，第Ⅷ节阳基侧突未被第Ⅷ腹片覆盖，阳基侧突明显分节，分 1+5 节；第Ⅸ腹节阳基侧突明显分节，分 1+5 节，阳茎明显短于阳基侧突；第Ⅸ肢基片后缘处有 0~1 根刺状刚毛。

新种与赫氏哈蚧 *H. hedini* (Silvestri) 相似，但体长、复眼中连线/长、阳基侧突分节、第Ⅸ肢基片刚毛数目具明显区别（赫氏哈蚧体长 9.2 mm，复眼中连线/长为 0.43，第Ⅷ

关键词 石蛎目，石蛎科，哈蚧属，新种，中国。

中图分类号 Q969.121

节阳基侧突 1+6 节，第Ⅸ腹节阳基侧突 1+7 节，第Ⅸ肢基片后缘处有 11~12 根刺状刚毛)。

正模 ♂，编号 NNUSB0275，江苏南京栖霞山，海拔 112 m，2004-05-22，张加勇采。

词源：新种种名以采集地栖霞山命名。

赫氏哈蚧 *Haslundichilis hedini* (Silvestri) (图 12~21)

体长 9.2 mm；复眼长/宽为 0.65，中连线/长为 0.43，复眼横向加宽，棕黑色；第Ⅷ、Ⅸ腹节上具阳基侧突，仅第Ⅸ腹节上具阳茎，第Ⅷ节阳基侧突未被第Ⅷ腹片覆盖，阳基侧突明显分节，分 1+6 节；第Ⅸ腹节阳基侧突明显分节，分 1+7 节，阳茎明显短于阳基侧突；第Ⅸ肢基片后缘处有 11~12 根刺状刚毛。

镜检标本：1 ♂，编号 NNUSB0279，甘肃天水麦积山，海拔 1 550 m，2006-07-26，张加勇采。

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